DOCUMENT RESUME

ED 368 405 JC 940 209

TITLE	Positions: MinnMATYC Position Statements.
INSTITUTION	Minnesota Mathematical Association of Two Year Colleges.
PUB DATE	[Jan 94]
NOTE	7p.
PUB TYPE	Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*College Mathematics; Community Colleges; Elementary School Mathematics; *Mathematics Curriculum; *Mathematics Education; Mathematics Instruction; *Mathematics Teachers; Policy Analysis; Policy Formation; Position Papers; *Prerequisites; Standards; Two Year Colleges
IDENTIFIERS	Minnesota Mathematical Assn of Two Year Coll

ABSTRACT

Developed by the major committees of the Minnesota Mathematical Association of Two-Year Colleges (MinnMATYC) and approved by its Executive Board, these four position statements are intended to guide discussion and influence decisions affecting mathematics in Minnesota's two-year colleges. The first position statement suggests that the prerequisite for any college level liberal arts math course should be 3 years of high school mathematics, including Algebra I, Geometry, and Algebra II, or Elementary and Intermediate Algebra taken in college. The second position taken by MinnMATYC is for a standardized curriculum in intermediate algebra, providing a list of prerequisite, mastery, and introductory skills designed to provide students with a sound foundation for success in higher level mathematics, science, and business courses. The third position statement calls for the addition of one college mathematics course intended for college transfer to the list of Associate in Arts and Associate in Science degree requirements. Finally, in response to national mathematics education initiatives, MinnMATYC's fourth position statement suggests that any course intended for prospective elementary teachers must require a demonstration of mastery of prerequisite topics and feature such elements as active participation by students, historical and cultural perspectives of mathematics, assistance in solving problems, and varied methods to present course material. (MAB)

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MinnMATYC

Minnesota Mathematical Association of Two-Year Colleges

ED 368 405

POSITIONS

MinnMATYC Position Statements

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CONTENTS:

•Prerequisite for College Level Liberal Arts Mathematics Course

•Standardization of Topics in Intermediate Algebra

•Mathematics Requirement for the A.A. Degree

•The Nature of a Mathematics Course for Prospective Elementary Teachers

PREREQUISITES FOR THE LIBERAL ARTS MATH COURSE

It is the position of MinnMATYC that the prerequisite for any college level liberal arts math course should be three years of high school mathematics, namely Algebra I, Geometry, and Algebra II, OR Elementary Algebra and Intermediate Algebra, numbered below 100, taken in college. MinnMATYC stresses the importance of having Elementary and Intermediate Algebra offered as developmental courses; the credits should not be considered as college level mathematics. Credit totals for Elementary and Intermediate Algebra could vary among campuses. Students could also satisfy the prerequisite for the liberal arts math course by taking a placement exam that exhibits mastery of Intermediate Algebra at the level of C or better. Exceptions for students with special needs could be considered, but students who wish to bypass the prerequisites should do so only after appropriate student/instructor discussion and after being cautioned that their preparation for the course may be lacking. Points supporting the Elementary Algebra and Intermediate Algebra prerequisites for the liberal arts math course are summarized below.

- The liberal arts math course should be a course in which students DO mathematics. The algebra skills and the mathematical maturity gained in Intermediate Algebra would provide the background needed in the liberal arts course. A liberal arts math course which is accepted for transfer at Minnesota Community Colleges, State Universities, and the University of Minnesota should be taught at this level.

- The University of Minnesota now requires all entering students to have a high school background of Algebra I, Geometry, and Algebra II, or to have taken Elementary Algebra and Intermediate Algebra as developmental work. The State University System will enforce the same entrance standards beginning in the Fall of 1994. Therefore, any student taking a liberal arts math course on those campuses will automatically have satisfied the desired prerequisite. Community Colleges should require the same background preparation of students taking the liberal arts course in their system.

- Students who have taken a liberal arts math course realize the need for algebra skills. Math departments are doing a disservice to students if they do not make it clear what will be required of them before they enroll for the course.

MinnMATYC recommends that college campuses in the state of Minnesota move to change their prerequisites to three years of high school mathematics or Intermediate Algebra as soon as it is feasible.

STANDARDIZATION OF TOPICS IN INTERMEDIATE ALGEBRA

Intermediate Algebra is a developmental mathematics course designed to provide students with sufficient preparatory skills and problem solving strategies for success in College Algebra, Statistics, Liberal Arts Mathematics, Mathematics for Elementary Educators, as well as science and business courses. As such, there must be minimal review of Introductory Algebra topics as well as mandatory placement into this core course via an appropriate placement tool. This course should be committed to an emphasis on logical thinking and problem solving skills and contain a good introduction to functions and their graphs. Additionally, it is imperative that uniformity exists with regard to classification of topics as Prerequisite, Mastery, or Introductory.

While current national projects seek to assess the needs of developmental mathematics and develop, pilot, and refine appropriate models for incorporation into the undergraduate curriculum, results are years away. Therefore, consistent with the intent underlying the Minnesota Higher Education Transfer Curriculum, MinnMATYC recommends the following classification and delineation of topics for any Intermediate Algebra course:

PREREQUISITE

- signed numbers
- algebraic expressions
- adding and subtracting polynomials
- graphing linear equations using intercepts
- number sets
- whole number exponents
- ratio and proportion

MASTERY

- linear equations
- graphing linear equations using slope and y intercept
- equations of lines
- linear inequalities - simple, compound, absolute value
- exponents - integer and rational
- polynomials - multiplication and division
- rational expressions - all operations
- rational equations
- radicals - simplifying, operations, and equations
- complex numbers
- systems of equations - 2 variables
- variations
- quadratic equations - all methods of solution

INTRODUCTORY

- quadratic - graphing
- quadratic inequalities
- rational inequalities
- functions and relations - to include inverse, exponential and their graphs
- logarithms - definition, properties, equations
- circles
- systems of equations - 3 variables
- systems of inequalities

THE MATHEMATICS REQUIREMENT FOR THE A.A. DEGREE

The Minnesota Mathematics Association of Two-Year Colleges (MinnMATYC) takes the position that a change in current Minnesota Community College System (MCCS) policy concerning the mathematics requirement for the A.A. degree occur as follows:

- In partial fulfillment of course requirements for the Associate in Arts (A.A.) or Associate in Science (A.S.) degree, students should take at least one college level mathematics course intended for college transfer. The college level mathematics course meeting this requirement must assume that students have the prerequisite skills of Intermediate Algebra.

This recommendation, if implemented, would require an upgrade in the A.A. degree requirements of some of Minnesota's Public Community Colleges. This change is consistent with demands on colleges to produce quality graduates, educated in the understanding of the importance of mathematics and quantitative measures in today's society. The current MCCS policy for the A.A. degree requires only that a "minimum of 12 credits shall be in ... Mathematics/Natural Sciences." Moreover, for the A.S. degree this policy requires only that at least 6 credits come from the category of Mathematics/Natural Sciences.

The position is supported by statements such as the following:

> "Industry spends as much on remedial mathematics education for employees as is spent on mathematics education in schools, colleges, and universities···. Because mathematics holds the key to leadership in our information-based society, the widening gap between those who are mathematically literate and those who are not coincides, to a frightening degree, with racial and economic categories. We are at risk of becoming a divided nation in which knowledge of mathematics supports a productive, technologically powerful elite while a dependent, semiliterate majority, disproportionally Hispanic and Black, find economic and political power beyond reach."
>
> National Research Council, Everybody Counts, A Report to the Nation on the Future of Mathematics Education. National Academy Press, Washington, DC, 1989, (pp. 13-14).

> "Articulation must be achieved with four-year colleges and universities so that students at two-year colleges might pursue appropriate mathematics with the confidence that the content, level of accomplishment and level of maturity within the course is comparable to that provided by higher level institutions···. Today, the primary goal of transfer courses is to prepare students to enter mathematics courses or courses with mathematics prerequisites at institutions beyond the two-year college···. The beginning undergraduate mathematics courses should be adapting and adjusting to support the mathematical skills that an expanding world knowledge base requires of an educated person···. Many courses in the two-year college transfer curriculum are prerequisite to other mathematics courses···(Such a course which is only) a review of algebra at a level no higher than Intermediate Algebra···is not appropriate for consideration for transfer to a baccalaureate granting institution···. A mathematics liberal arts course,··· to enhance its transferability to four-year colleges,···should have at least at least an intermediate algebra prerequisite."
>
> Davis, Ronald M. (editor), A Curriculum in Flux, Mathematics at Two-Year Colleges, Mathematical Association of America, 1989. (pp. 4,6,9)

THE NATURE OF A MATHEMATICS COURSE FOR PROSPECTIVE ELEMENTARY TEACHERS

In order for teachers to carry out their responsibility for the education of the youth of this country, they need to be adequately prepared to teach with confidence in their knowledge. The Mathematical Association of America (AMA), in its document *A Call for Change*, stresses the urgent responsibility of college mathematics departments to provide prospective teachers with experiences that enable them to

- acquire mathematical knowledge
- understand the concepts and processes inherent in mathematics
- see the interrelationships among the various branches of mathematics
- recognize the relationships of mathematics to other disciplines
- feel more confident in their ability to do mathematics
- have an appreciation of the power, beauty, and fascination of mathematics

The Curriculum Evaluation and Professional Teaching Standards developed by the National Council of Teachers of Mathematics (NCTM) are having a profound impact on school mathematics. Their on-going implementation at the elementary school level will require a substantially increased mathematics background on the part of the teacher. Minnesota four-year institutions of higher education have in place substantial requirements of high school college preparatory mathematics.

To respond to these national mathematics education initiatives and State requirements, MinnMATYC takes the following position regarding any mathematics course intended for prospective elementary teachers:

PREREQUISITES:

- Three years of college preparatory mathematics (including elementary algebra, geometry, and intermediate algebra or the completion of these courses at the college level).

- Students entering college with the above prerequisite should demonstrate mastery of the topics contained in an intermediate algebra and a geometry course by passing a math assessment test at a level commensurate with other college level mathematics courses.

PEDAGOGY:

- Topics must be presented in a manner that allows active participation by the prospective teachers.

- Students must have the opportunity to explore mathematics, collect and represent data, reason logically, communicate mathematical ideas effectively, use technology appropriately, and present mathematics from a historical and cultural perspective.

- Students should be able to solve problems and present material using a variety of methods.

CONTENT: The topics in these courses should include, but not necessarily be limited to:

- Elementary Number Theory
- Simple probability
- Measurement and estimation
- Use of technology
- Recognizing the patterns of arithmetic, algebra, and geometry
- Geometric concepts of length, area, and volume
- Uses of ratio, proportion and percent in real world applications
- Spatial relations of congruence, similarity, and symmetry
- Data collection, representation, and analysis